

An  
Inaugural Dissertation.

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on  
Tetanus.

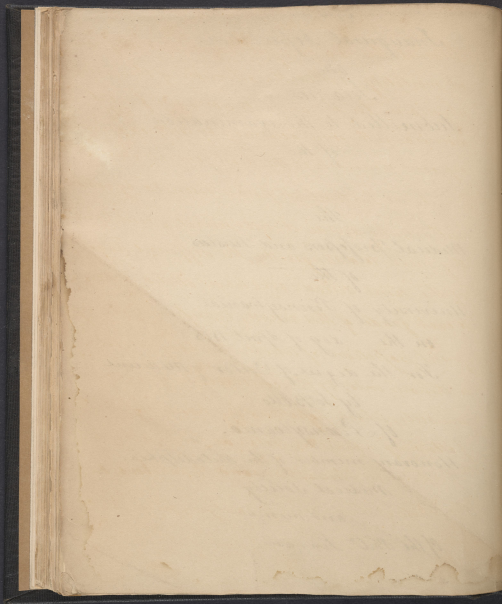
Submitted to the examination  
of the

The  
Medical Professors and Trustees  
of the

University of Pennsylvania  
on the day of April 1808

For the degree, of Doctor of Medicine  
by Joseph B. Otto  
of Pennsylvania.

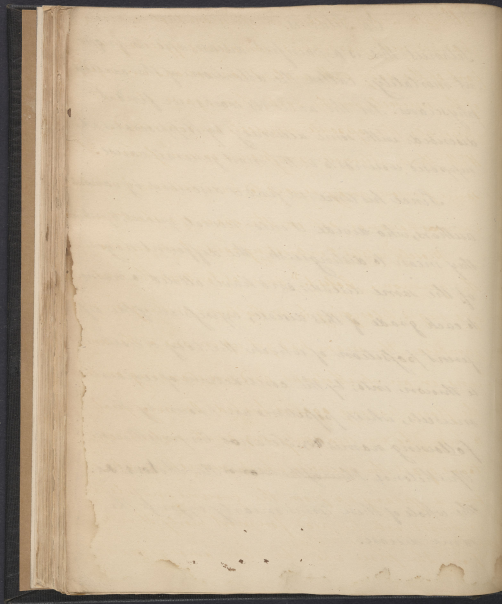
Honorary member of the Philadelphia  
Medical Society  
and member  
of the Phil<sup>a</sup> Linnaean



### On Tetanus.

Tetanus, this is a painful disease, and its frequent mortality; called the attention of the earliest physicians. In the ancients works, we find it described, with some accuracy by Hippocrates, who supposed wounds to be the most general cause.

Since his time, we find it described by various authors, who divide it into several species, by which they mean to distinguish the different stages of the same disease; and have allotted a name to each grade of this disease, expressive of the different position of which the body is liable to be thrown into, by the contraction of certain muscles, which positions are known by the following names. viz. Tetanus, Emprostotonus, Opisthotonos, ~~Pluvasthantonus~~ Pluvasthotonus &c. The whole of these terms nearly express the same disease.





All late writers concur in opinion that tetanus changes with paroxysms, sometimes effecting one part of the body with violent contractions and rigidity of the muscles on the back, then again at short intervals, the opposite muscles are contracted.

With those alternate remissions & intermissions, the same person may be said to have tetanus, Opisthotonus, Cramp, or Thostonos, all in the space of a short time.

Moseley relates 2 interesting cases which corroborate this opinion. Case 1. " Once, as I entered the hut of a negro belonging to Mr. St. Bond, in Kingston in Jamaica, the man had got up in one of the remissions, in an opisthotonus, and was standing on the floor, leaning against his bed. On my speaking to him, he was suddenly seized with violent contractions of all the muscles, which curved him like a bow, & sprang up from the ground and pitched backward, with his head foremost nearly three yards from the place where he stood, amongst some

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poth that were in the corner of his hurt. By the fall  
he cut his head very much, & divided the temporal  
artery. He died within two hours.

Case 2. "In which every part of a woman's body  
was convulsed, or rendered stiff and rigid by turns.  
Sometimes her head was turned to the right side,  
then to the left, then backward as in the *opisthotonus*,  
then forward, as in the *emprosthotonus*."

This disease may and does occasionally; occur  
in every climate that we are acquainted with.

Yet it occurs most commonly, in the warmest seasons  
of such climates. So much so indeed; that it has  
been considered endemical in such climates.

Hillery, observes the *arthristick*, suffered pretty much  
in a dry cool season; and several persons were seized  
with *opisthotonus* & *tetany* from seemingly very  
slight causes.

Mostly likewise *remprostetanus*,



is endemical among children, many places between the tropics; but by no means, as some have supposed, depending on situations near the sea, or exposed to the winds; when it attack them, it is generally on the eight or ninth, and seldom after the twelfth or fourteenth day, from their birth.<sup>u</sup>

Though the cause do, upon occasion, affect all sorts of persons, they seem however, to attack persons of middle age more frequent than the older or younger, the male sex more frequent than the females, the robust & vigorous more frequent than the weaker.<sup>u</sup>

Monro remarks the negroes, are more subject to tetanus than the whites. This he supposes, is owing to an increase of irritability & diminished sensibility. He likewise observes the algerines & moroccans, are much distinguished for privation of sensibility.

*[The page contains faint, illegible handwriting, likely bleed-through from the reverse side.]*

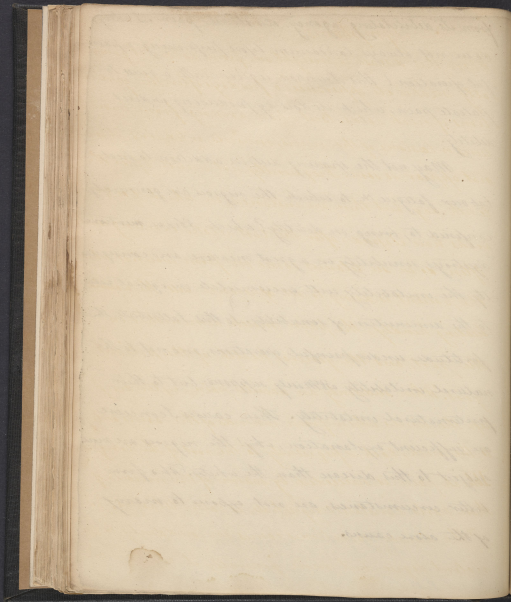
as the negroes. Here, I cannot agree with the illustrious  
morley, that this increase irritability, & diminished sensibility  
is natural, but may be acquired from certain causes.  
Which I shall briefly enumerate. We have many instan-  
ces of debility destroying pain; Hence criminals can  
bear the greatest punishments inflicted with fortitude;  
of this we have a striking instance, a case mentioned  
by Dr Priest, a man who was sentence for some crime  
to suffer punishment at stated periods. He bore it  
with uncommon fortitude, and almost without a  
groan. Being asked how he bore it, he answered he  
always fastened 2 or 3 days before his punishment  
came on? Again, do we not see delicate females?  
who from disease have not taken much nourishment,  
bear operations of the most painful kind with com-  
-posure, and scarcely uttering a groan. Further,  
Bleeding so much recommended in parturition to  
relax the rigidity<sup>of</sup> of the os uteri and the adjacent parts,





from its debilitating agency, also allivates pain. Lastly, do we not always laudanum before performing a painful operation? this I suppose is given with a view to palliate pain, which it does by producing indirect debility.

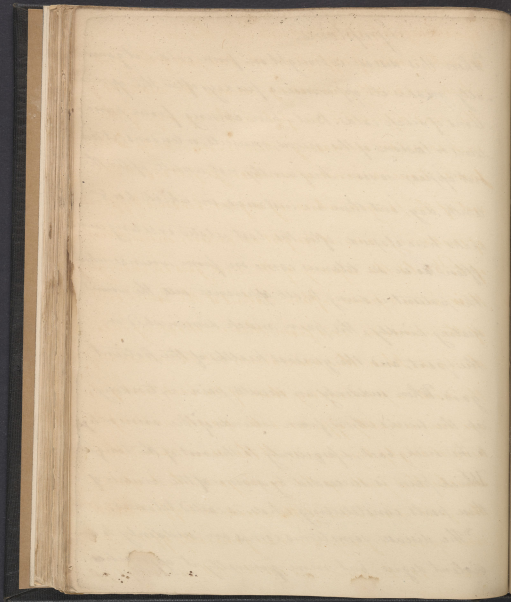
May not the spraining diet, in addition to heat, labour, fatigue &c, to which the negroes are generally confined to, bring on debility? which I have mentioned destroys sensibility in a great measure and consequently the irritability will accumulate in equal ratio, to the diminution of sensibility. To this I attribute their fortitude under painful operations, and not to the natural irritability as ~~Mr~~ mostly supposes; but to their preternatural irritability. These causes I conceive are sufficient explanation, why! the negroes are more subject to this disease than the whites. Who from better circumstances, are not exposed to many of the above causes.



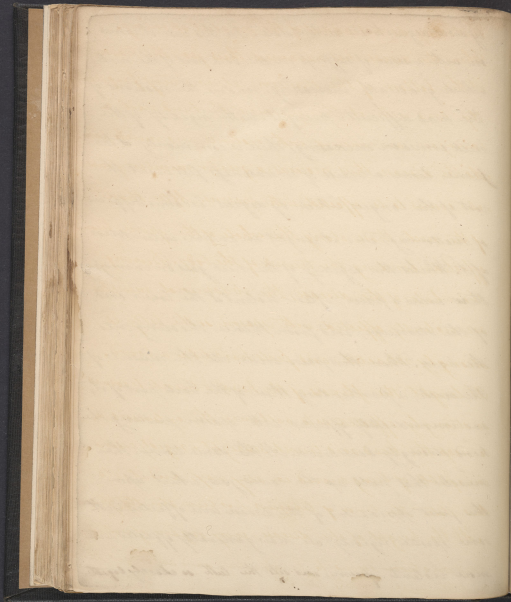
## Symptoms.

When this disease is brought on from cold, it generally makes its appearance; a few days after the applications of such colds. But when arising from punctures or lesions of the nerves, muscles, or tendons, it does not appear so soon. Frequently not until after the tenth day, but there are instances, in which 6 or 8 weeks have elapsed, after the last related exciting cause. Often as we see tetanus come on from wounds, when the patient is doing to all appearance well the wound healing kindly, the pain much diminished in the part, and the general health of the patient good. When suddenly an acute pain extending up the limbs when from wounds of the arms or legs, to the neck, back, & frequently to the root of the tongue. Which pain is succeeded by spasm of the muscles of those parts, constituting what is called tetanus.

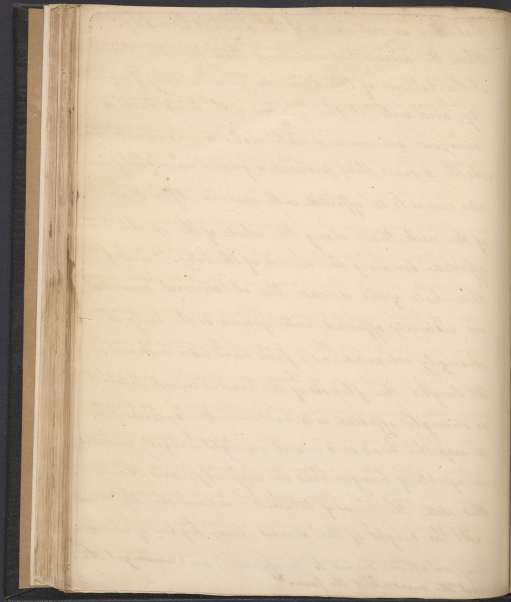
The disease sometimes comes on suddenly to a violent degree, but more generally it approaches



by slow degrees to its violent state. In this case it comes on with a sense of stiffness in the back part of the neck, which gradually increasing, renders the motions of the head difficult & painful. As the rigidity of the neck comes on increasing, there is commonly at the same time a sense of uneasiness felt about the root of the tongue, which by degrees, becomes difficult of swallowing, and at length an entire interruption of it. Whilst the rigidity of the neck goes on increasing, there arises a pain, often violent at the lower end of the sternum, and from thence shooting into the back. When this pain arises, all the muscles of the neck, & particularly those of the back part of it, are immediately affected with spasm, pulling the head strongly backwards. At the same time, the muscles that pull up the lower jaw, which upon the first approaches of the disease were affected with some spastic rigidity, are now generally affected with more violent spasm, and sets the teeth so closely together



that they do not admit of the smallest opening.  
When the disease has advanced thus far, the pain  
at the bottom of the sternum returns very frequen-  
-tly; and with it the spasms of the hind neck &  
lower jaw, are renewed with violence and much pain.  
As the disease thus proceeds, a greater number of mus-  
-cles comes to be affected with spasms. After those  
of the neck, those along the whole of the spine become  
affected, bending the trunk of the body. During  
the whole of the disease, the abdominal muscles  
are violently affected with spasm so the belly is  
strongly retracted, and feels hard like a board.  
At length the flexors of the head & trunk become  
so strongly affected as to ballance the extensors, &  
to keep the head and trunk straight & rigidly extended,  
incapable of being moved in any way; and it is to  
this state the term of tetanus has been strictly applied.  
At the height of the disease, every organ of volun-  
-tary motion seems to be affected; and amongst the  
rest the muscles of the face.





The forehead is drawn up into frowns, the eyes, sometimes distorted, are commonly rigid, and immoveable in their sockets; the nose is drawn up, and the whole countenance expresses the most violent grinning. Under these universal spasms, a violent convulsion commonly comes on, and puts an end to life."

These spasms, are every where attended with most violent pains. The utmost violence of spasm is however, not constant; but, often subsisting for a minute or two, the muscles admit of some remission of their contraction, altho of no such relaxation as can allow the action of their antagonists.

This remission of ~~their~~ contraction gives also some remission of pain; but neither is of long duration. From time to time, the violent contractions & pains are renewed sometimes every ten or fifteen minutes, and that often without any evident exciting cause. But such exciting causes frequently occur, for almost every attempt of motion, as attempting



a change of posture, endeavoring to swallow & even to speak, sometimes gives occasions to a renewal of the spasms over the whole body."

"Although fever is not a constant attendant of this disease, especially when arising from lesions of nerves; yet in those cases <sup>proceeding</sup> ~~producing~~ from cold, a fever sometimes has supervened, and is said to have been attended with inflammatory symptoms."

"Blood has been often drawn in this disease, but never exhibits any inflammatory crust, and all accounts seem to agree, that blood drawn seems to be of a looser texture than ordinary, and that it does not coagulate in the usual manner. — In this disease

the head is seldom affected with delirium, or even confusion of thought, till the last stage of it, when, by the repeated shocks of a violent distemper, every function of the system is greatly disordered."

Tetanus often proves fatal before the fourth day; and when a patient has passed this period, he may



be supposed to be in greater safety, & in general the disease is the safer the longer it has continued: It is however, to be particularly observed, that even for many days after the fourth, the disease continues to be dangerous, & even after some considerable abatement of its force, it is ready to recur again with its former violence and danger, It never admits of any sudden, or what is called critical solution, but always recedes by degrees only, and it is often very long before the whole of the symptoms disappear.

### Predisposing causes.

These are all such as induce debility either directly, or indirectly particularly of the muscles.

1. Cold this has long been considered, as an active agent in producing debility.

2. Debilitating passions of fear, grief, & despair.

3. Want of sufficient aliment. All these act, directly in inducing this debility.



4. Heat, this is universally acknowledge, to be the predisposing cause of tetanus. Hence the frequency of it in the tropical climates.

5. Unusal labour and exercise: hence we find tetanus more frequent occurring; from wounds received in battle, than at any other time.

To these causes may be added excess in venery, and indeed every thing which tends to induce debility.

From what has already been said, I infer that debility from abstraction or action, constitutes the predisposition of this disease. However, this debility does not appear to be universal, but more particular seated in the muscles, which may be infered from their being almost exclusively the seats of the disease, for were debility equal in every part of the body, we would have universal disease; as many of the occasional causes of tetanus, are such as frequently inducing fever when preceded this requisite predisposition.





*Of the exciting causes.*

The partial division of a nerve or tendon, was believed by the ancients to be the most frequent cause of this disease. By since those times experience & observation has taught us that superficial wounds, on any part of the body, may excite the disease.

Cold, this in some instances has been known to be the exciting cause of this disease, more especially after exposure to intense heat. Of this Sydenhame mentioned many instances. Boerhaave relates an instance of its having been induced by a person's sleeping without a night cap after shaving his head. The cool air more certainly brings on this disease, if applied to the body in the form of a current.

Certain poisonous vegetables. These are several cases upon record of its being induced by hemlock Dropwort and the delirious stramonium &c

† *Musk* wrote vol 8 pag 252    † *Boston* & *Muske* Sect.



Lastly, certain emotions and passions of the mind." "Senor brought it on a brewer in the city. He had been previously debilitated by great labour, in warm weather. I have heard of its having been induced in a man, by agitation of mind, occasioned by seeing a girl tread upon a nail. Fear excited it in a soldier who knelt down to be shot. Upon being pardoned he was unable to rise from a sudden attack of tetanus."

#### Of the pathology.

From the symptoms and many of the causes, am naturally led to suppose the disease to exist in the muscles, but in what manner the cause act appears difficult to ascertain. Mostely seems to suppose that it is a spasm seated only in the muscles & subservient to the animal functions. And this whether original, or symptomatical, "Is caused by irritation, which depending



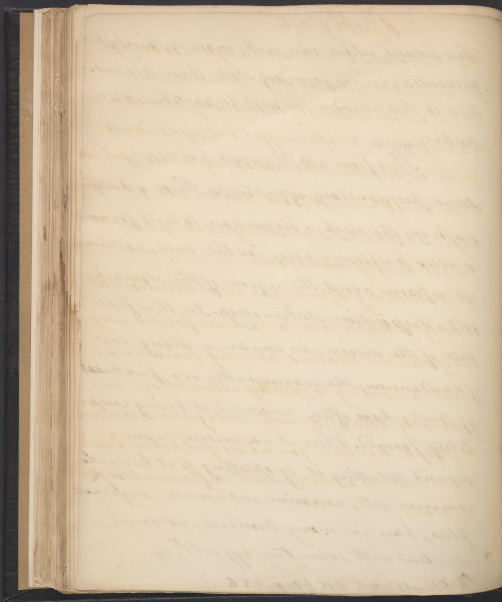
alike upon irritating impressions, made upon  
any one part of the body, producing morbid  
excitement, or disease in another. It is immate-  
-rial whether the impression be made upon the  
intestines by worms, upon the ears by ungrateful  
noise, upon the mind by a strong emotion,  
or upon the sole of the foot by a nail; it  
is alike communicated to the muscles,  
which from their previous debility and  
irritability are thrown into commotion by  
it. In yielding to the impressions of irritants,  
they follow their contractions the order of  
their predisposing ~~at~~ debility. The muscles  
which move the lower jaw, are affected more  
early, and more obstinately than any of the  
other external muscles of the body, only because  
they are more constantly in a relaxed or idler  
state." &



### Trophylaxis.

Two diseases, which can with more certainty be prevented, in its forming state than tetanus. And to this period we should be particularly attentive.

Thus from all its causes, has nearly the same premonitory symptoms. These are stiffness, in the neck, a disposition to bend forward, in order to relieve a pain in the back, costiveness, a pain about the region of the stomach, and a disposition to start in sleep. In this early state of the disease, an emetic, a strong dose of laudanum, the warm bath, or a few doses of Bark, have often prevented it being completely formed. When it has arisen from a wound, dilating it, by applying to it turpentine, common salt, corrosive sublimate, or Spanish flies, have in many hundred instances attended with salutary effects.





## Cure.

The indications of cure are 1<sup>st</sup> to lessen or abate the morbid excitement of the muscles, which may be accomplished 1<sup>st</sup> by Bloodletting, 2<sup>d</sup> Emetics, & 3<sup>d</sup> Purgatives. 2<sup>d</sup> after sufficient depletion to remove or overcome the disease by tonics & remedies.

These are 1<sup>st</sup> opium, 2<sup>d</sup> Bark, 3<sup>d</sup> wine, 4<sup>th</sup> of Amber, 5<sup>th</sup> Cold & hot baths & mercury: each of which I shall briefly mention.

Bloodletting I find, has been mentioned as early as Hippocrates, & has been found very beneficial in tetanus, arising from cold; which according to Hillery's observation, are generally attended with phlogistic diathesis. It likewise has been found useful when arising from wounds attended with inflammatory symptoms.



## Emetics & Cathartics.

These have been employed in some cases with success, especially when the disease is the effect of fever, the same remedies should be given as are employed in the cure of that fever. I have once unlocked the jaws of a woman, who was seized to the same time with a remitting fever by emetic &c. They also prove serviceable, where acid substances or poisons are taken into the stomach. Purges may be used with a view, to evacuate the alimentary canal, thereby expelling the acrid feces, & sometimes worms which cause irritation.

## Opium.

According to B. Bhalmer, opium is universally necessary; and it must be given with <sup>a</sup> bold hand, and at short intervals of time between the doses, untill the end is answered. Mostely absorbed it has been given to the extent of one dram.

the first two chapters in this book are  
 devoted to the study of the  
 human mind and its powers  
 of perception and reasoning  
 in the case of the human mind  
 the powers of perception and reasoning  
 are the result of the action of the  
 senses and the intellect  
 the senses are the organs of perception  
 and the intellect is the organ of reasoning  
 the senses are the organs of perception  
 and the intellect is the organ of reasoning  
 the senses are the organs of perception  
 and the intellect is the organ of reasoning

Chapter I

Of the nature and powers of the human mind  
 the human mind is a faculty of perception  
 and reasoning  
 the human mind is a faculty of perception  
 and reasoning  
 the human mind is a faculty of perception  
 and reasoning  
 the human mind is a faculty of perception  
 and reasoning

every two or three hours, together for several day without inducing sleep. But sleep, in those large doses, do we often find it ineffectual in removing this disease.

### Bark and Wine.

D. Rush mentions one case, in which the opium failed in large & repeated doses, when it was immediately dismissed; and gave large quantities of bark & wine, to the amount of two or three ounces of the former, and from a bottle to three pints of the latter in a day; in a few ~~days~~ hours I was delighted with their effect: His spasms and pains were less frequent and violent, & he slept for several hours, which he had not done for several day & nights before. With the same indication in view, I applied a blister between his shoulders, and rubbed in two or three annas of mercurial ointment upon the outside of his throat. He continued to mend gradually under the operation of these medicines, so that in ten day he was out of danger. <sup>But</sup> the spasm continued in his wounded foot for several week afterwards. + [Memoirs of the Society of London. Rush's case]



### Ardent spirits.

A quack in New England has lately cured tetanus, by giving it in such large quantities as to produce intoxication.

### Oil of Amber.

This from its action on the muscular system is much recommended by many authors, in the cure of tetanus; and should be given in considerable doses and repeated.

### Cold bath.

This has in many instances performed cures, we find it mentioned by Hippocrates, and since his time is recommended by many authors. "In one of two cases in which I have used it with success, the patient's jaw opened in a few minutes after the effusion of a single bucket upon her body."

### Warm bath.

This has often been used with success, mostly

18th Nov 1801

I have the honor to acknowledge the receipt of your letter of the 11th inst. in relation to the above mentioned subject.

Yours &c

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cured a Captain Thompson of a tetanus, only by putting him into a warm bath, three times a day; and given him small doses of laudanum & antimonial wine. This medicine kept up a great perspiration, caused by the bath; which I judged to be the most proper method of treating a tetanus as his was from obstructed perspiration from the night air. x

### Mercury.

This has been employed with a view to salivate by many practitioners, and when this could be accomplished the disease generally terminated favorably. Dr Young mentions a case, which he cured by means of this medicine, after Opium, wine, bark, oil of Amber had failed. x. I think also said he saw a case which was cured in the hospital by this medicine. But unfortunately the phlogism cannot be generally excited early enough to be of service.

x. Morley on tropical diseases pag 503. & Boston Med & Phys Journal vol 1 pag 67 by Young

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## Scalons.

Have ~~been~~ often been used with advantage.  
Desportes says, he cured a negro woman by  
making a sealon in her neck, with an hotnoodle  
Blisters.

Dr Girdlestone commend, Blisters in high fevers  
in this disease. He says he never saw it prove  
fatal, even where they only produced a redness  
on the skin. x

